

**Geodetic Measurements for Urban Earthquake Hazard in
San Diego, California: the Rose Canyon Fault Zone**

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Investigations Undertaken, Results

This grant supports remeasurement of an accurate GPS network spanning the Rose Canyon fault, an active fault running through the heart of urban San Diego. Geological estimates of the rate of motion on this fault are about 1–2 mm/yr; however, this rate comes from trenching at a single site, which may not span the entire fault zone, and the geometry of the fault system is poorly understood to the south of San Diego, in part because it crosses both the coastline and the international border. Geodetic measurements can help to elucidate both the geometry and the rate of motion; those collected so far suggest a higher rate of motion, 3–4 mm/yr, across the San Diego area.

In 1998, with NEHRP support, we constructed four high-precision “GPS clusters”: multiple monuments in stable material, spaced from 30 to 400 m apart, and special equipment to center GPS antennas over these points to 0.2 mm repeatability. The purpose of these clusters is to decrease the level of monument-related noise by averaging over multiple locations: an alternative to deep-braced monuments. Two of these clusters lie east of the fault, and one to the west, on Pt. Loma; a fourth (near the border) is in the area in which the fault location is uncertain. Multiple surveys of these clusters in 1998 and 1999 showed that we can indeed measure positions within a cluster to better than 0.3 mm rms.

We are in the process of making repeat surveys to the marks in this network, starting with retraining personnel in the use of the ultraprecise centering methods that are a key part of the project. The field program has begun with occupations of the marks on Point Loma that will provide the best estimate of motion across the fault. Some time has been required to get permissions to revisit some of the marks, in view of increased security concerns both at Point Loma and near the international border. We are also in the process of getting permission to reoccupy marks last observed in 1996 on San Clemente Island, to improve velocity estimates for this “far-field” location, and have begun to examine SCIGN data from sites in the area.

Non-Technical Summary

This grant supports remeasurement of an accurate GPS network spanning the Rose Canyon fault, an active fault running through the heart of urban San Diego. Measuring the motions of points in this network between our first survey in 1998, and now, will show us how much motion is occurring at depth across this fault—motion that would someday be released in an earthquake. So these measurements will provide information to improve our estimates of the seismic hazard and risk from the Rose Canyon fault zone.

Reports and Data Availability

We have not published any reports as yet, though a paper on the monument cluster and antenna mount is in preparation. All GPS data collected will be archived at the SCEC Data Center, where they are publically available.